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Implementation of an Interactive Videodisc Program: An Ethnographic Study

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ABSTRACT

This ethnographic study examines the process of implementing an interactive videodisc program in a senior high school. The research questions were: What happened during the implementation process and what factors facilitated or hindered the implementation of the innovation? Descriptive data were collected through participant observation, interviews, and artifact collections. Study results revealed that implementing an educational innovation is a complex, multidimensional process involving the organization, the people, and the innovation. Effective implementation depends on the combination of all the factors described in the study, including initiation; planning, preparation, and support; communication and collaboration; district and school policies; teachers' realities; students' characteristics; change strategies; and characteristics of the innovation.

Introduction

As technology development continues, educational institutions are planning and expanding technology-related learning experiences. However, the implementation of a technology-related educational innovation is a highly complex process involving relationships between end-users and change agents; people and technology. The implementation often involves changes in curriculum, changes in instructional approaches, changes in people's attitudes, behaviors, knowledge, skills, and changes in interpersonal interactions among people. Much of the research on educational innovations is characterized by a heavy reliance on recall from memory, a short time frame, and after-process data gathering (Rogers, 1983). Such research tends to neglect the in-process complexities and difficulties of implementation which have a vital influence on the eventual adoption of an educational innovation. Rogers further suggested that innovation-related research methodologies should include longitudinal investigations, broader contexts, multiple perspectives, and in-process studies. Hord, Rutherford, Huling-Austin, and Hall (1987) also noted that efforts to understand the change process should concurrently focus on the individuals, the innovation, and the context of the innovation. The research reported herein followed the above guidelines when examining the implementation of an educational technology innovation in a high school.

Purpose and Questions of the Study

The purpose of this study was to investigate and analyze the process of implementing an interactive videodisc program in a high school. The design of the study was an ethnographic case study which involved intensive data collection on many instances of the phenomenon over an extended time period. The study attempted to reflect the various dimensions of the implementation process from the point of view of the people involved, primarily the teachers, the media specialist, and the administrators. The research questions of the study were:

1. What happened during the implementation process?
2. What were the factors that facilitated or hindered the implementation of the innovation?

Methodology

Rationale for Ethnographic Case Study Approach

The basic assumption underlying the research design was that implementation of an educational innovation is a change process occurring over time and involving the interaction of the people, the innovation, and the context. All these three elements were considered simultaneously in this study by using an ethnographic approach, thereby creating a complete and credible study of the implementation.

Setting

A mid-west comprehensive high school, referred to by the pseudonym "North High School (NHS)," was selected as the setting for this study. Selection of this school was made because the school was chosen by th

Library of Congress as the test site for an interactive videodisc program -- American Memory.

Innovation

The educational innovation that was examined in this study was the American Memory program. The program, collections of historical primary sources, included photographs, manuscripts, motion pictures, books, and sound recordings appropriate for use in American History classes. The hardware of the program included a Macintosh microcomputer, a CD-ROM player, a videodisc player, and a television monitor.

Participants

The selecting and sampling process in this study included strategies for expanding the scope of the study, refining the questions or constructs under investigation, and generating new lines of inquiry. In general, the study employed two means of participant selections: criterion-based or "purposive sampling" (Patton, 1980) and "snowballing" (Delamont, 1992). The participants of the study included: program users (8 teachers), program coordinator (1 media specialist), program initiators (2 district administrators -- media and social studies coordinators), school administrators and staff, and students.

Data Collection Methods

The ethnographic approach used multiple data collection strategies to provide the flexibility needed to study diverse aspects of setting, innovation, and participants. Participant observation, formal interviews, informal conversations, and artifact collection were the primary data collection methods of this study. The combination of multiple data collection strategies provided more complete and complex data than do unimodal research designs, therefore enhancing the credibility of study.

Analysis and Interpretation Strategies

A "concurrent approach" (Marshall & Rossman, 1989) was employed in which data analysis is simultaneous with data collection. On the basis of the strategies suggested by Goetz and LeCompte (1984), the data analysis included theorizing, sequential selection, and general analytic procedures. The researcher looked for "repeatable regularities" of the phenomena and events (Miles & Huberman, 1984). Themes and subthemes representing the recurring patterns were developed to indicate the ebb and flow of the implementation process. Together the themes and subthemes answered the research questions; they indicated the interrelatedness of the factors involved with the setting, the innovation, and the people during the implementation process.

Findings

After examining the implementation process, the data were analyzed, categorized, and conceptualized into the major themes, which together tell a complete story of the implementation phenomenon and reveal dynamic interrelation of the setting, the innovation, and the people which influenced the implementation processes. The themes and subthemes take their form from recurring patterns which have similar characteristics. The five themes are: agendas and actions; teachers'

realities; the haves and the have-nots; the role of the internal program coordinator; and the reactions to the innovation.

Agendas and Actions

In general, the American Memory program was initiated by the district administrators without bottom-up participation of the teachers and the media specialist at the school level. In fact, the initiation was mainly opportunism -- the program was there, and the grant was not difficult to write for. Minimal instructional needs or curricular goals were identifies.

The initiation was not followed by careful planning and preparation, by clarified staffing and responsibilities, by effective communication, by proactive change strategies, or by the provision of sufficient resources.

It was also worth noting that the district administrator, the media specialist, and the teachers were making efforts to enhance the technology inventory of the school. However, no relationships were identified or made between the technology equipment and the school's instructional needs or curricular goals.

Teachers' Realities

The teachers' working conditions were time-bounded and management-conscious. The teachers had to attend to various responsibilities such as classroom management, material coverage, administrative duties, professional development demands, and school and district policies. Surrounded by multiple realities, teachers were faced with the difficulty of "squeezing" the American Memory program into their practice or discussing the program with their colleagues.

Additionally, competing with other instructional demands required by the school district, the American Memory program was not considered as a top priority by the teachers. While exercising their limited autonomy, the teachers were likely to rule out using the American Memory program in their classroom instruction.

The Haves and the Have-Nots

Like a cafeteria providing different foods for different customers, the NHS offered different courses for the different students. Also, like a cafeteria designing foods for different classifications of customers, the school designed courses as an intellectual diet for different students' categories. Not every student could take any course he or she wanted. In order to take certain courses, students had to meet certain requirement.

The tracking and ability grouping in NHS had a great impact on the students in terms of the distribution of learning opportunities, day-to-day school experiences, classroom climates, utilization of educational resources, and access to the American Memory program. In addition, the teachers' expectations and instructional strategies also differed for the various ability.

Role of Internal Program Coordinator

Using the school media specialist as an internal program coordinator resulted in mixed outcomes. The familiarity of the school environment and the technological skills the media specialist already had were very important to utilizing the program. However, the multiple working loads of the media specialist seemed to have negative impact on

the effectiveness of the program implementation. The roles of the school media specialist can be divided into formal and informal categories. The formal and informal roles constructed media specialist's work span.

In addition, the distribution of authority in the school seemed not to equip the media specialist with enough power to help her in implementing the program.

Reactions to the Innovation

Throughout the implementation, the American Memory program received limited use because it was not effectively integrated into the instruction and because the teachers and students had limited knowledge about the technology and the program. Besides, the value of "primary sources" was seldom mentioned. The curricular goal and instructional objective of integrating the American Memory program into the senior high school social studies curriculum were not identified or clarified.

In addition, it was unclear if the use of primary sources was a goal for social studies instruction or just a novelty used for entertainment, attention-getting, or enhancing assignments with visuals. It was also questionable whether using primary source material in senior high school social studies curriculum will even establish it significance. In stead of exploring and enjoying the interactive learning experience as proposed by the Library of Congress, district administrators, and media specialist, the teachers and students sometimes felt frustrated while using the program.

Implications

Implementation of an educational innovation is a complex, multidimensional process. The study was not able to identify any discrete factor as dominating the implementation process. Rather, all the themes and subthemes presented in the study should be taken together to represent the critical factors in the implementation process. Seven implications are drawn for understanding the process of implementing the interactive videodisc program:

Implication: The top-down initiation of an innovation with little bottom-up participation may impede the implementation of the innovation.

The findings of the study indicated that the school district administrators initiated the innovation with very little involvement of teachers or the media specialist. The teachers and the media specialist perceived the program as just one of the various demands put upon them. This top-down initiation with little bottom-up participation seemed to result in the lack of teachers' commitment to or interest in the implementation. Such findings re-emphasized a finding in the literature: The less teachers are involved in the decision making processes, the lower their acceptance and support for the innovation and the lower their morale regarding adoption of the innovation (Combs, 1991; Louis & Miles, 1990).

However, Salisbury (1992) indicated that in order to have large-scale change it is very important to have proper sponsorship from the top so the innovation will be sustained. Salisbury argued that the

bottom-up model can only facilitate small-scale change, because an innovation usually requires support beyond the resources of an individual school. People at the top are the ones who can provide pressure as well as support, such as equipment, funding, personnel, and rewards. In this study, if people at the top had provided implementation pressure and support, the program might have been more fully implemented.

Marsh (1988) suggested that the blending of top-down initiative and bottom-up participation is often a characteristic of successful implementation. The combination of pressure and support from educational leaders along with high levels of participation from school personnel is probably the more effective approach.

Implication: The implementation planning, teacher preparation, and on-going monitoring may affect the implementation process.

The study showed that there was a lack of planning for implementing the program to fit into the educational system. The curricular goals and instructional objectives were not identified. Ambiguous strategies and unspecified work division preceded anxiety, uncertainty, and confusion for the people involved. As many research findings indicated, an innovative program imported from outside an organization not only needs to be modified to improve the "fit" between the innovation and the conditions in the system; but the structure of the organization may also have to be changed to accommodate the innovation; otherwise the ability of people to deal with the innovation will be impeded (Fullan, 1991; Guskey, 1988; Louis & Miles, 1990; Rogers, 1983). In this case, if the program was taken as a priority of the school district and teachers were provided with time and incentives, the program might have had a better chance to be more fully implemented.

The findings also indicated that the district administrators' preconception of innovation adoption was somewhat simplistic. Their reliance on a single inservice program to prepare teachers was neither realistic nor appropriate, because each teacher had a different reaction toward the program. In addition, teachers said they needed to know more about the program in order to be able to use it effectively. The need to respond to teachers' individual concerns and the need for additional teacher training are obvious. The findings were consistent with the argument of Hord, Rutherford, Huling-Austin, and Hall (1987) that one of the most common and serious mistakes made by administrators and leaders in the change process is to presume that once a program had been introduced and initial training has been completed, the users will put the program into practice. A serious mistake is to assume that all users of the program will react in a similar way.

Teachers in the study indicated that the pre-implementation training was insufficient. One-shot workshop prior to and even during implementation is found to be not very helpful. As Wedman (1986) suggested, an inservice program introducing an entire package of computer technologies can only serve to raise teachers' awareness at the beginning stage of the implementation. Individuals' concerns are often focused on different parts of the technology. During implementation, teachers need to be offered additional training on skills and knowledge

which deal with the computer, Hypercard, reference search techniques, and the videodisc player. Additionally, and perhaps more importantly, teachers need to be provided with time to learn and plan curricular integration of the program.

Although the innovation under study was initiated by upper level educators, the process of implementation was not monitored. In fact, people involved paid only minimal attention to their obligations. The attitude of "let's play with it and see what happens" seemed to be prevalent in the organization. The belief that "nothing will be perfect for the first year," even though the program was proposed by the administrators to foster an atmosphere of risk-taking, seemed to serve as an excuse for people to pull back rather than move forward. Fullan (1991) noted that monitoring the innovation process serves two functions. First, by making information on the program available, it provides access to good ideas. Many good practices go unreported because teachers, schools, and districts are isolated from each other. Second, monitoring exposes new ideas to scrutiny, helping to weed out mistakes and further develop promising practices. Neither of these advantages were realized at NHS.

Implication: Implementation without frequent communication among the people involved may impede the process of innovation implementation.

The study revealed that the communication network did not run very effectively. Specifically, there was little communication and discussion among the initiators, program coordinator, and users. Two reasons may apply: there was no information system; and people were too busy with other duties.

The lack of an established information system at NHS was evident in two ways. First, the newsletters were not circulated among the administrators and the teachers. Second, data was not gathered on how the program was being used in the classrooms and school. As a result, the district administrators were unaware of the progress of the program. Ornstein & Hunkins (1988) cautioned that communication channels during the implementation process must be kept open, and the communication network must be comprehensive, so that the people involved can be allowed to input, discuss, and interact with each other.

The findings also revealed that teachers did not have time to learn from other colleagues. Partly because of the physical isolation and partly because of the norms of not observing or discussing each other's work, teachers did not develop a common "technical culture" (Fullan, 1991, p. 119). Therefore, teachers did not have clear and exact information about the program; the knowledge of the program was not diffused among the teachers. The finding was consistent with the research evidence that teachers interact with each other infrequently (Goodlad, 1984; Rosenholtz, 1989). Sarason (1990) commented that the isolation of teachers in the school organization negatively impacts on the innovation implementation.

Implication: Implementation with little understanding of teachers' realities may impede the use of an innovation.

The study showed that teachers' realities were defined by diverse influences. Teaching at NHS was always bound and influenced by the policy and opinions from the state, district, community, and parents. Teachers' realities were also shaped by school policy, schedules, activities, curriculum coverage responsibilities, students' characteristics, and teachers' personal knowledge and skills.

The teachers in this study faced the program with various reactions. The reactions were influenced by both the organizational and personal dimensions of teaching. Organizational dimensions included an emphasis on academic achievement, a focus on subject, and a perception among teachers that they had little influence on policy. Personal dimensions included level of experience with technology and length of service with the school district.

The school culture, with its strong emphasis on students' academic achievement, did not give teachers much cause for implementing a program which was not perceived as relevant to academic achievement. The teachers mentioned the competing demands of several teaching improvement programs promoted by the district which often cause confusion and anxiety for the teachers. Rosenholtz (1989) cautioned that an innovation given less emphasis by school and district administrators will have less of a chance to be accepted by the teachers. Since American Memory program was not proposed as the top priority of the school district, it was less likely to be implemented by teachers.

The findings of the study indicated that teachers who frequently used computers and media services showed stronger intentions to use the program. For those who were not comfortable with the new technology, the resistance to the program tended to be much greater. Such tendency is consistent with the finding indicated in the literature that teachers who experience satisfaction in using a technology are more accepting of the computer related innovation. And teachers who express high levels of enthusiasm toward computers are more likely to be heavy computer users (Schofield & Verban, 1988).

Implication: The grouping of students by ability may affect teachers' expectations and students' access to educational technology.

The study findings indicated that teachers' expectations toward students affected their selection of teaching strategies and resources for the students. Teachers' expectations toward different ability groups of students seemed to result in differential treatments of students. Although this study did not attempt to answer questions dealing with the relationship between teachers' expectations and students' learning, the findings of the study seemed to be consistent with past research on teachers' expectations.

Research evidence is available to demonstrate that some teachers provide different ability students with sharply different learning opportunities, with students of high potential tending to receive more stimulating environments (Good, 1987; Oakes, 1985, 1992; Oakes & Lipton, 1990). This rich-get-richer scenario occurred in NHS classrooms. The interactive videodisc program was perceived as complicated and novel by

the teachers. Therefore, the teachers made the decision not to have "less competent" low-tracked students the opportunity to use the program. Such a tendency is consistent with the evidence of class-, race-, and ability-based differences in computer use (Apple, 1992; Sutton, 1991), raising issues of equality and equity of access to educational resources by different ability student groups.

Implication: The change agent responsibilities and strategies may affect the implementation of an educational innovation.

Using a media specialist as an internal change agent in the school setting seemed to result in mixed effects. One of the advantages was that the media specialist was knowledgeable about the interactive videodisc technology and had credibility in terms of providing technical assistance to the teachers. In addition, such an in-house expert was more familiar with the organization and teachers. However, questions arose regarding the overloaded responsibilities of the media specialist and the cordial relationship she tried to maintain with the teachers. With too many roles -- formal and informal -- to fulfill and too little time to undertake them, the media specialist could not fully attend to the implementation of the program. In addition, the media specialist, in fact, had no power over the teachers. As a result, there was hardly any pressure which is necessary for successful implementation.

The media specialist in this study also indicated that she lacked subject matter expertise and expected the teachers to plan the integration of the program into the existing curriculum. This finding was consistent with the argument raised by Becking (1986) and Femian, Benedict, and Johnson (1988) that practical courses on working with teachers and on services and curriculum development are essential for the school media specialist. Without teachers' commitment and subject matter expertise, the technical expertise of the media specialist alone did not warrant the program's utilization. One possible way to avoid reliance on the single change agent might be to use the "multiplier mode" proposed by Miles, Saxl, and Lieberman (1988). The strategy combines the expertise of subject matter teachers and the expertise of the technical specialist.

This study illustrated that several change strategies the school media specialist used might have affected the implementation process. First, the media specialist tended to interact more with people who had more computer knowledge. Also, her use of technical terminology appeared to distance her from the teachers. Her passive approach to providing information on the program may also have slowed down the speed of diffusion. Strudler (1991) cautioned that an effective change agent must possess strong interpersonal and organizational skills to carry out necessary training and support functions. These skills include initiative-taking, securing resources, program continuation, and facilitating group-functioning and decision. Strudler also argued that successful change tend to play down their computer expertise and resist being called "the expert." Rather, they prefer to be seen as just another teacher who knows something about using computers in school. By de-emphasizing their expertise, change agents could minimize the discrepancies that exist between them and teachers.

Implication: An innovation that is perceived to be complicated and less educationally significant may have less of a chance of being implemented.

The study showed that the interactive videodisc program involved the combination of different technologies such as a computer, videodisc player, CD-ROM, and television; and the program was regarded as time-consuming, complicated, and novel by the teachers. When the value of "primary sources" was not a consideration, teachers and students chose to use other competing resources such as videotapes, microfilms, newspapers, and magazines which were perceived as easier to use. Such findings were consistent with Rogers' (1983) caution that an innovation will have a higher chance of being adopted if it is perceived to have low complexity, high relative value, high trialability, high observability, and high applicability.

The study indicated that the information presented through the combination of technologies was confusing to users. Hypercard is considered a powerful tool with non-linear thinking characteristics so users can choose their own learning strategy according to individual needs. while the idea of giving learners control of their own learning may have a strong intuitive appeal, the study findings did not show that users always choose or appreciate what is designed for them. some users were impatient about the wait-time and a few were confused by the various icons presented on a single-screen display. Some teachers were reluctant to organize the instruction by themselves. Some expected the information to be organized in a package. The strong interests of students in watching the "execution of the prisoner who assassinated President McKinley" in the program was regarded as entertaining rather than educational.

These reactions are consistent with literature regarding the barriers to using the interactive video. As Jonassen (1988) and Jost (1990) pointed out, several problems occur in using interactive video technology: difficulties in navigation as the user gets lost in the unstructured knowledge base; difficulties in integrating information into personal knowledge structures and in synthesizing and tuning that knowledge; and cognitive overload. Attention should be given to the design and development of interactive videodisc programs, the iconic metaphors of the computer screen display, and the instructional strategies for interactive videodisc programs.

Researcher's Reflection

The researcher was a foreigner in the United States and an outsider to its schools. As such, the researcher was impressed that teachers and students in the American educational system were able to have access to an instructional program like American Memory. However, the researcher was also impressed that the implementation has so little direction and that the program was not really utilized by the teachers and students.

Gathering information on the financial and human resource investment by the Library of Congress in developing this program was outside the scope of this study. Nor did the researcher know how the decision was made by the Library of Congress to develop the American Memory program. but if the program is not being used by teachers and

students, if the program has not established its instructional significance, then questions must be asked about why the Library of Congress developed it and who has really benefited from this interactive videodisc program? Perhaps the NHS school district, NHS itself, and the district administrators who applied for the grant received the most benefit -- promoting their public and personal images. Or, perhaps the Library of Congress which developed the program shared this benefit. If that is the case, if school administrators, federal officials, and their organizations, but not the students, realized the greatest benefits, then one must question the value of promoting technology-related innovations in education.

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